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Agroforestry Notes

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Silvopasture: An Agroforestry Practice

Definition

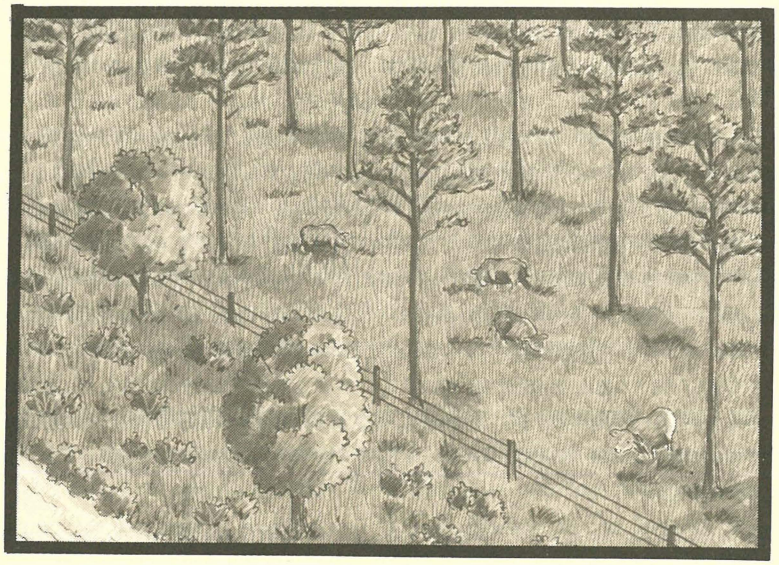
Although some form of silvopasture management has been practiced for centuries, silvopasture as an agroforestry practice is specifically designed and managed for the production of trees, tree products, forage, and livestock. Silvopasture results when forage crops are deliberately introduced or enhanced in a timber production system, or timber crops are deliberately introduced or enhanced in a forage production system. As a silvopasture, timber and pasture are managed as a single integrated system.

Objectives

Silvopastoral systems are designed to produce a high-value timber component, while providing short-term cash flow from the livestock component. The interactions among timber, forage, and livestock are managed intensively to simultaneously produce timber commodities, a high quality forage resource, and efficient livestock production. Overall, silvopastures can provide economic returns while creating a sustainable system with many environmental benefits. Well-managed silvopastures offer a diversified marketing opportunity that can stimulate rural economic development.

Planning Considerations

Before new silvopastoral systems are established, implications of merging forestry and agricultural systems should be explored thoroughly for economic and environmental considerations along with local land use, zoning, cost-share program, and tax regulations. Forest and agricultural land may have separate zoning and land-use regulations



Silvopasture combines trees with forage and livestock production. The trees are managed for high-value sawlogs and at the same time provide shade and shelter for livestock and forage.

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accompanied by divergent tax assessments. Environmental requirements (e.g., planting trees, stream-side protection, wildlife habitat maintenance, etc.) also may vary with land use.

Plant Considerations

When making tree and forage crop selections, consider potential markets, soil type, climatic conditions, and species compatibility.

The timber component should be:
- marketable,
- high quality,
- fast growing,
- deep-rooted,
- drought tolerant, and
- capable of providing the desired products and environmental services.

On marginally productive lands, conifers are well-suited for silvopastures because they can adapt to diverse growing sites, respond rapidly to intensive management, and permit more light to reach the forest floor. Select and use trees and planting/harvesting patterns that are: a) suitable for the site; b) compatible with planned silvopastoral practices; and c) provide desired economic and environmental returns.

The forage component should be a perennial crop that is:
- suitable for livestock grazing,
- compatible with the site (soil, temperature, precipitation),
- productive under partial shade and moisture stress,
- responsive to intensive management, and
- tolerant of heavy utilization.

Livestock Selection

Potential livestock choices include: cattle, sheep, goats, horses, turkeys, chickens, ostriches, emu, rhea, or game animals such as bison, deer, elk, caribou, etc. The selected livestock system must be compatible with tree, forage, environment, and land use regulations. In general, browsing animals such as sheep, goats, or deer are more likely to eat trees; whereas, large grazing animals such as cattle or elk or more likely to step on young trees. Younger livestock are more prone to damage trees than are older, more experienced animals. Livestock are more likely to impact hardwood trees than conifers.

Design and Establishment

Silvopastures can be established on any land capable of simultaneously supporting tree and forage growth. However, silvopastoral systems can require a relatively large land base to sustain timber and livestock production continuity. A source of local technical assistance is essential to develop a silvopastoral system matched to local conditions and landowner objectives. Appropriate establishment methods depend on: 1) woodland/forest type (e.g., site conditions, and tree species, age, pattern, and spacing) or existing pasture situation; 2) whether even-aged or uneven aged silviculture is practiced; and 3) landowner objectives (e.g., timber products, environmental benefits, wildlife, etc.). Appropriate grazing systems depend on climate, terrain, tree species, tree age, other vegetation, kind of livestock, labor requirements, and extent of fencing, water supplies, and supplementary equipment.

Tree pattern is an important factor for silvopasture success. Trees can be evenly distributed over the area, as in Figure 1, to optimize growing space and light for both trees and forage. Alternatively, grouping trees into rows or clusters concentrates their shade and root effects while providing open spaces for pasture production. Trees are typically pruned to increase light penetration and develop high-quality sawlogs. Silvopastures of varying ages can be merged and managed on a landscape basis.

The establishment of forage in even-aged or uneven aged silvicultural situations may require thinning and some type of tillage to provide a favorable seedbed for germination and growth. On rangeland or pasture sites, forage suppression (e.g., herbicide, tillage, mulch, etc.) may be required for 2-3 years to establish tree seedlings, but suppression methods must be carefully selected to avoid damaging desirable plants.

Management

Livestock grazing should be intensively managed. A successful silvopasture requires understanding forage growth characteristics and managing the timing and duration of grazing to avoid browsing of young tree seedlings or elongating shoots. Livestock should be excluded from tree plantings during vulnerable periods. Similar approaches can minimize damage by trampling or rubbing. Improper management of silvopastures can reduce desirable woody and herbaceous plants by over-grazing and soil compaction. Thus, proper management is the key to success.

Available management tools include:

- tree harvesting, thinning, or pruning;
- fertilization to improve both forage and tree production;
- planting legumes for nitrogen fixation and forage production;
- multi-pasture, rotational grazing;
- rotational burning;
- supplemental feeding;
- developing water sources (e.g., stock tanks, windmills, photovoltaic pumps, hydraulic rams, ridge reservoirs, etc.);
- locating salt/mineral licks, and walkways to encourage uniform livestock distribution; and
- fencing (e.g., standard or electric), tubing, plastic mesh, repellents, and seasonal livestock exclusion to reduce damage to young seedlings.

Benefits

Economic

Integrating trees, forage, and livestock creates a land management system to produce marketable products while maintaining long-term productivity. Economic risk is reduced because the system produces multiple products, most of which have an established market. Production costs are reduced and marketing flexibility is enhanced by distributing management costs between timber and livestock components. Comprehensive land utilization in silvopastoral systems provides a relatively constant income from livestock sale and selective sale of trees and timber products. Well-managed forage production provides improved nutrition for livestock growth and production. Potential products of the tree component include: sawtimber, veneer logs, pulpwood, firewood, pine straw, posts and poles, harvested game, nuts, fruit, ornamental flowers and greenery, maple syrup, mushrooms, organic mulches, and other secondary products.

Woodland and forage

Grazing can control grass competition for moisture, nutrients, and sunlight, thereby enhancing tree growth. Well managed grazing provides economical control of weeds and brush without herbicides, maintains fire breaks, and reduces habitat for gnawing rodents. Fertilizer applied for forage is also used by trees. In addition, livestock manure recycles nutrients to trees and forage.

Livestock

Some forage species tend to be lower in fiber and more digestible when grown in

a tree-protected environment. Trees that provide shade or wind protection can have a climate-stabilizing effect to reduce heat stress and windchill of livestock. Protection from trees can cut the direct cold effect by 50% or more and reduce wind velocity by as much as 70%. Livestock require less feed energy, so their performance is improved and mortality is reduced.

Environmental and Aesthetic

Silvopastures can increase wildlife diversity, and improve water quality. The forage protects the soil from water and wind erosion, while adding organic matter to improve soil properties. Silvopastures provide an attractive landscape with an aesthetically pleasing "park-like" setting. In contrast to concentrated livestock operations, silvopastoral systems are less likely to raise environmental concerns related to water quality, odors, dust, noise, disease problems, and animal treatment.

Additional Information

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